

Energy and water vapor transport in a turbulent stratified environment

Original

Energy and water vapor transport in a turbulent stratified environment / Gallana, Luca; DE SANTI, Francesca; Iovieno, Michele; Tordella, Daniela. - STAMPA. - (2015). (Intervento presentato al convegno 68th American Physical Society - Division of Fluid Dynamics Annual Meeting 2015 tenutosi a Boston nel 22 - 24 novembre 2015).

Availability:

This version is available at: 11583/2630416 since: 2016-02-09T10:38:32Z

Publisher:

American Physical Society

Published

DOI:

Terms of use:

openAccess

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Energy and water vapor transport in a turbulent stratified environment LUCA GALLANA, Politecnico di Torino, FRANCESCA DE SANTI, MICHELE IOVIENO, Politecnico di Torino, DIMEAS, RENZO RICHIARDONE, Universita' degli Studi di Torino, DANIELA TORDELLA, Politecnico di Torino, DIMEAS — We present direct numerical simulations about the transport of kinetic energy and unsaturated water vapor across a thin layer which separates two decaying turbulent flows with different energy. This interface lies in a shearless stratified environment modeled by means of Boussinesq's approximation. Water vapor is treated as a passive scalar (Kumar et al. 2014). Initial conditions have Fr^2 between 0.64 and 64 (stable case) and between -3.2 and -19 (unstable case) and $Re_\lambda = 250$. Dry air is in the lower half of the domain and has a higher turbulent energy, seven times higher than the energy of moist air in the upper half. In the early stage of evolution, as long as $|Fr^2| > 1$, stratification plays a minor role and the flows follows closely neutral stratification mixing. As the buoyancy terms grows, $Fr^2 \sim O(1)$, the mixing process deeply changes. A stable stratification generates a separation layer which blocks the entrainment of dry air into the moist one, characterized by a relative increment of the turbulent dissipation rate compared to the local turbulent energy. On the contrary, an unstable stratification slightly enhances the entrainment. Growth-decay of energy and mixing layer thickness are discussed and compared with laboratory and numerical experiments.

Daniela Tordella
Politecnico di Torino

Date submitted: 01 Aug 2015

Electronic form version 1.4